

June 29, 2012

Sent Via Electronic Mail & Hand Delivery

Ms. Carmen Anderson
Indiana Department of Environmental Management
IDEM Remediation Services Branch
100 N Senate Ave
MC 66-30V INGC N1101
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Re: Response to IDEM's Request for Revised Remediation Work Plan
Approval Review and Technical Response to General Notice of Potential Liability Review
Michigan Plaza Site (VRP# 6061202)
3801-3823 West Michigan Street
Indianapolis, Indiana

Dear Carmen:

ENVIRON has completed a review of the March 16, 2012 Response to IDEM's Request for Revised Remediation Work Plan Approval Review and Technical Response to General Notice of Potential Liability Review (MUNDELL Response Letter) prepared by Mundell & Associates, Inc. (MUNDELL) for the Michigan Plaza Property (VRP #6061202) located at 3801-3823 West Michigan Street in Indianapolis, Indiana (Plaza Site). The MUNDELL Response Letter is based in a large part on the findings of the March 16, 2012 Additional Investigation Activities Summary Report (MUNDELL AIAS Report) prepared by MUNDELL in response to concerns identified by IDEM in the June 22, 2011 "Request for Revised Remediation Work Plan Approval Review and Technical Response to General Notice of Potential Liability Review" letter. In that correspondence, IDEM expressed concerns regarding the characterization of the Plaza Site and requested additional delineation of the source areas, as well as, investigation to the west of the Plaza Site toward Holt Road on the residential properties and south of MMW-P-09D to identify vinyl chloride impacts on the Floral Park Cemetery property. IDEM also requested the installation of additional deep monitoring wells in the source areas.

ENVIRON has completed a review of the MUNDELL AIAS Report and findings of the review are detailed in our separate correspondence dated June 7, 2012. Based on the information presented in the MUNDELL AIAS Report, it is apparent that the recent investigation activities do not adequately

address the IDEM concerns. Our review identified a number of significant internal inconsistencies with the stated utility and accuracy of the data presented in the report and MUNDELL's interpretations of subsurface conditions and related chemical fate & transport conclusions, including those related to the Genuine Parts Voluntary Remediation Program Site, VRP #6991004 (Genuine Parts Site). Copies of the ENVIRON June 7 2012 review letter regarding MUNDELL's AIAS Report (ENVIRON Review Letter) along with the MUNDELL AIAS Report and related MUNDELL March 16, 2012 Geophysical Survey Investigation Report (MUNDELL GSI Report) are provided as Attachment A for reference. Our concerns with the MUNDELL Response Letter are discussed below.

A. Summary of Review of MUNDELL AIAS Report.

Our review of the MUNDELL AIAS Report identified a number of significant internal inconsistencies with the stated utility and accuracy of the data presented in the report, as well as, inconsistencies and concerns with resultant interpretations of subsurface conditions and related chemical fate & transport conclusions. Based on identified data gaps, it is apparent that the recent investigation activities do not adequately address the IDEM concerns identified in their June 22, 2011 letter.

The MUNDELL GSI Report provided with the MUNDELL AIAS Report does not provide a reliable geologic and hydrogeologic interpretation of the Plaza Site and surrounding area. Unconfirmed till surface features (e.g., till hill) are interpreted to be present across the area. These unproven features are interpreted to control groundwater flow and related chemical fate and transport within the lower portion of the sand and gravel unit. The inferred flow patterns are not consistent with those based on actual groundwater potentiometric surface data. Related dissolved chemical plume maps are not consistent with groundwater chemistry data.

Although seismic surveys were reportedly conducted, seismic data are not included with the GSI Report. These data should be produced by MUNDELL to allow for an evaluation of the degree of correlation with boring log and resistivity data, as well as, the presence of interpreted till highs and lows. The unconfirmed till highs and lows presented by MUNDELL should be field verified with soil borings. If these features are demonstrated to be present, a much more detailed hydrogeologic study with densely spaced wells should be conducted by MUNDELL to verify the hypothesized complex groundwater flow directions. In addition, the downhole geophysical surveys do not clearly indicate soil types present in the blind drilled sections or the till surface contact in deeper monitoring wells. Actual geologic data should be collected by MUNDELL from the locations of blind drilled wells, particularly deep wells presumed to be screened at the sand/till contact (e.g., MMW-11D, 13D and MMW-14D; MMW-P-3D, 9D, 10D).

A series of dissolved VOC constituent plume maps were prepared by MUNDELL for the shallow and deep portions of the surficial sand & gravel unit. It is not clear what data were used in the generation of these maps as no data points are included on the figures. The figure titles indicate that data from the October 2011 monitoring well groundwater sampling event were the basis of the maps. Consideration of this data alone would result in an incomplete interpretation of dissolved plumes. It is apparent that critical data points have not been considered in preparing maps, resulting in interpreted plumes inconsistent with groundwater chemistry data. It is also apparent that at least the deep plume maps are inconsistent with the groundwater flow directions of conceptual groundwater flow model

presented in the MUNDELL GSI report. The interpreted plumes are substantially different from past MUNDELL plume maps.

The findings of the MUNDELL AIAS Report demonstrate that further investigation by MUNDELL is necessary to better understand the groundwater flow and chemical fate and transport in the area of the Plaza Site. Salient activities that should be conducted by MUNDELL include the following:

- Till Hills and Depressions inferred by MUNDELL to be present from the GSI should be field verified.
- Actual geologic data should be collected from MUNDELL's blind drilled monitoring well locations
- The Plaza Site source areas should be further delineated, particularly to west.
- Additional deep monitoring wells should be installed in the Plaza Site source areas
- Further investigation should be conducted between the Plaza Site and West Vermont Residential Site to better understand the direction of groundwater flow and dissolved VOC occurrence in this area. The presence of potential preferential pathways such as the sanitary sewer line encountered during the installation of MMW-P-11D should be evaluated as a part of this investigation.

B. Comments on MUNDELL's Delineation Activities.

Provided below are ENVIRON's comments to statements made by MUNDELL in the MUNDELL Response Letter regarding pre-2011 and 2011 delineation activities. The comments are organized by specific sections of the MUNDELL Response Letter.

MUNDELL's Overview of Pre-2011 Delineation of Chlorinated Groundwater Impacts.

MUNDELL incorrectly makes generalizations about a stated wide spread nature of shallow and deep c 1,2 DCE and VC occurrence in groundwater allegedly attributable to the Genuine Parts Site. Historical MUNDELL maps are cited as a basis for the statements (Figures 1A-D, 2A-D). It is clear from the studies referenced by MUNDELL in this section and subsequent work by MUNDELL that the Plaza Site is the primary source of PCE and related daughter products including c 1,2 DCE and VC at and downgradient of the Plaza Site. Significant PCE and related daughter product impacts related to the Plaza Site are present on the Michigan Meadows Apartments property. MUNDELL also incorrectly states that PCE is a "marker chemical" that distinguishes Plaza Site groundwater impacts and that relative c 1,2 DCE and VC concentrations in groundwater distinguish the Plaza Site. The above Overview generalizations and inaccuracies are further discussed below.

1. PCE as Alleged Distinguishing "Marker Chemical".

Past investigations by MUNDELL have identified significant PCE and daughter product impacts in groundwater at and originating from the Plaza Site. Shallow monitoring wells located in the identified Plaza Site source areas contained reported concentrations of PCE up to 6,440 micrograms per liter (ug/L) (MMW-P-08), TCE up to 368 ug/L (MMW-P-01), c 1,2 DCE up to 364 ug/L (MMW-8S), and VC up to 82.1 ug/L (MMW-8S) prior to the initiation of CAP 18™ and CAP 18 ME™ injections (Injections) in August 2007 (ENVIRON Tables 1 and 2, ENVIRON Review

Letter). Maximum dissolved impacts were identified in Source Area B (ENVIRON Figure 4, ENVIRON Review Letter). Only two deep monitoring wells (MMW-P-03D, MMW-P-10D) were installed at the Plaza Site prior to the implementation of the Injections. These monitoring wells are located within Source Areas A and B, respectively. Prior to the Injections, PCE was reported at a maximum concentration of 48.9 ug/L (MMW-P-3D), TCE at up to 10.6 ug/L (MMW-P-10D), c 1,2 DCE up to 498 ug/L (MMW-P-10D) and VC up to 118 ug/L (MMW-P-10D). Monitoring well analytical results are presented in Tables 1 and 2 of the attached ENVIRON Review Letter. These pre-Injection findings provide salient information regarding the impact of the Plaza Site sources on groundwater. Significant c 1,2 DCE and VC impacts were identified in the shallow zone and it is clear their occurrence is related to the Plaza Site. Similar concentrations of these daughter products were identified in the deeper zone within the source areas. The deep wells contained detectable PCE or TCE concentrations. The data clearly indicate that significant levels of daughter products attributable to the Plaza Site were present in the shallow and deep groundwater in the source areas prior to the initiation of the Injections at the site. An absence of PCE detections in MMW-P-10D confirms that not all Plaza Site impacted groundwater contains this constituent. MW-168D, located just downgradient of the Source Area A, also contained detectable c 1,2 DCE and VC concentrations in the absence of PCE prior to the initiation of the Injections (Tables 1 and 2, ENVIRON Review Letter).

2. Alleged Distinguishing Concentrations of C 1,2 DCE and VC.

MUNDELL's incorrect statement that the Genuine Parts Site groundwater impacts can be distinguished by c 1,2 DCE and VC concentrations in shallow groundwater of less than 500 ug/L and deeper groundwater impacts with c 1,2 DCE and VC concentrations of greater than 500 ug/L is inconsistent with the data.

Figure 3 of the MUNDELL Response Letter is cited by MUNDELL as being representative of historical c 1,2 DCE and VC concentrations. Figure 3 is an incomplete and poor representation of groundwater impacts south of Little Eagle Creek west of Holt Road prior to the Injections at the Plaza Site. Only data from shallow and deep monitoring wells located outside of the Plaza Site source areas are included on the map. A review of all of the monitoring well data shows that only deep monitoring wells MW-165D and MMW-6D, both located in the northern portion of the Michigan Meadows Apartments, contained both c 1,2 DCE and VC in concentrations averaging more than 500 ug/L prior to the Injections at the Plaza Site (Table 2, ENVIRON Review Letter). Neither of these deep monitoring wells has contained an average VC concentration of more than 500 ug/L since the initiation of the Injections in 2007. Only well MMW-P-10D located in Plaza Site Source Area B has contained both c 1,2 DCE and VC at an average concentration of more than 500 ug/L since then (Table 2, ENVIRON Review Letter).

For unexplained reasons, none of the data from monitoring wells located in the three Plaza Site source areas were shown on Figure 3. Although only two deep wells were installed by MUNDELL in the Plaza Site source areas prior to the initiation of the Injections, these wells (MMW-P-3D and MMW-P-10D) were excluded from Figure 3 of the MUNDELL Response Letter. Data from shallow and deep monitoring wells from the Plaza Site collected prior to the initiation of the Injections at the Plaza Site do not support the statement that the impacts are distinguishable based on relative concentrations of c 1,2 DCE and VC in groundwater. Past investigations by MUNDELL have

identified significant PCE and daughter product impacts in groundwater at the Plaza Site that are clearly attributable to the Plaza Site. Shallow monitoring wells located in the identified Plaza Site source areas have contained reported concentrations of c 1,2 DCE and VC less than 500 ug/L prior to the initiation of Injections at the Plaza Site (Tables 1 and 2, ENVIRON Review Letter). In addition, significant concentrations of c 1,2 DCE and VC were detected in Plaza Site source area deep well MMW-P-10D prior to the Injections. As stated above, the c 1,2 DCE and VC concentrations in MMW-P-10D have increased substantially since this time.

Pre-Injection groundwater data provide salient information regarding the impact of the Plaza Site sources on groundwater. Significant c 1,2 DCE and VC impacts were identified in the shallow zone and it is clear their occurrence is related to the Plaza Site. Similar concentrations of these daughter products were identified in the deeper zone within the source areas. The deep wells contained detectable PCE or TCE concentrations. The data clearly indicate that significant levels of daughter products attributable to the Plaza Site were present in the shallow and deep groundwater in the source areas prior to the initiation of the Injections at the site. Data collected from MMW-P-03D and MMW-P-10D following the implementation of the Injections indicated increases in daughter products c 1,2 DCE and VC by one to two orders of magnitude since commencement in August 2007. C 1,2 DCE and VC have also increased by orders of magnitude in shallow wells located in Source Areas A, B, and C since the Injections were initiated at the Plaza Site (ENVIRON Review Letter, Tables 1 and 2). These findings further substantiate and confirm that impacts from the Plaza Site including daughter products c 1,2 DCE and VC extend throughout the entire thickness of the saturated sand/sand and gravel unit (shallow and deep zones) and that the Plaza Site is the primary source of the daughter products in groundwater within this area. PCE is not a reliable "marker chemical" to distinguish Plaza Site groundwater impacts. As previously stated, an absence of PCE detections in MMW-P-10D and MW-168D prior to the initiation of the Injections confirms that not all Plaza Site impacted groundwater contains this constituent (Tables 1 and 2, ENVIRON Review Letter).

In the MUNDELL Response Letter, MUNDELL incorrectly states "...that *[the Genuine Parts Site]* plume extends south through the Apartments (MW-166D), and to the west (MW-167D) and southwest (MW-170D) of the Plaza (refer also to the recent 2011 deep groundwater VC plume shown in Figure 18)." As discussed throughout this correspondence, there are inconsistencies between MUNDELL's interpreted and actual groundwater flow directions and related dissolved chemical plume maps, including Figure 18 of the MUNDELL Response Letter. Conceptual groundwater flow patterns shown in Figure 10B of the MUNDELL GSI Report are not consistent with observed flows in the deep groundwater of the sand unit, including Figure 12 of the MUNDELL Response Letter. Figure 10B of the MUNDELL GSI Report shows groundwater flow being diverted around an inferred till hill. Based on this interpretation of groundwater flow, c 1,2 DCE and VC impacted groundwater would not flow from MW-167D toward MW-170D. C 1,2 DCE is present in MW-167D but not MW-170D. More importantly, VC impacts at MW-170D are an order of magnitude greater than MW-167D (Table 1 and 2, ENVIRON Review Letter). Therefore, MUNDELL's interpretation that c 1,2 DCE and VC impacted groundwater flows from MW-167D toward MW-170D is inconsistent with the data. The VC concentrations in MW-170D have significantly increased since the initiation of the Injections at the Plaza Site to address the source areas of the Plaza Site. Further delineation of the Plaza Site source areas, as well as, investigation between the Plaza Site source areas and the West Vermont Street Residential Site needs to be conducted by MUNDELL to better understand the potential relationship.

MUNDELL's 2011 Further PCE Delineation.

1. PCE Source Areas; DNAPL.

To date, three source areas related to past dry cleaning operations at the Plaza Site have been identified by MUNDELL investigations, including leaking sewer lines. Approximate general locations of the identified source areas are illustrated on Figure 4 of the ENVIRON Review Letter. Although some further investigation was conducted by MUNDELL, these source areas have not yet been fully delineated. Available data collected to date during the source investigations and remediation monitoring confirm that dry cleaner related impacts extend throughout the entire thickness of the saturated sand/sand & gravel unit (shallow and deep zones) and that the Plaza Site is the primary source of c 1,2 DCE and VC, as well as PCE and trichloroethene (TCE), to groundwater within the identified Plaza Site source areas. Additional monitoring wells are needed within the Plaza Site source areas and downgradient to delineate related impacts and to monitor remedial progress, as further discussed below.

In 2007, soil borings and monitoring wells were installed in the southern portion of the Michigan Meadows Apartments and northern portion of the Michigan Plaza property to further investigate potential leaking sewer line impacts identified during previous investigations (Mundell 2006, Mundell 2007). Soil data from borings MMW-8S, MMW-9S, MMW-10S, MMW-P-07, and MMW-P-08 located in Source Areas B and C indicated PCE concentrations ranging from approximately 70 to 450 times the IDEM RISC guidance delineation criteria (RDCL). The samples were collected from a single depth at each boring ranging from about 14 to 20 feet bgs depending upon the boring (ENVIRON Figure 4, ENVIRON Review Letter). The identified soils impacts were not vertically delineated.

Findings of the recent additional investigation activities confirm that additional delineation of the Plaza Site source areas is necessary. Duplicate soil samples collected from boring MMW-P-12 D, located near the western Michigan Plaza property boundary within Source Area B, contained PCE concentrations three orders of magnitude (75,200/51,300 µg/kg) above the RDCL (Figure 4, ENVIRON Review Letter). Further westerly delineation of Source Area B on the adjacent residential property is warranted. As illustrated on Figure 4, further delineation of Plaza Site Source A is also needed. Soil sampling conducted in this area by KERAMIDA Environmental, Inc. in 2000 identified a PCE concentration more than 200 times (16,000 micrograms per kilogram) the RDCL southwest of the Michigan Plaza Building (KERAMIDA, 2004). The location of this sample, KB-24, is indicated on Figure 4 of the ENVIRON Review Letter. A groundwater sample collected by MUNDELL from this general area (MMW-P-11S) in October 2011 contained a PCE concentration of more than two orders of magnitude (592 micrograms per liter) above the RDCL. In Section 4.2 of the MUNDELL AIAS Report, MUNDELL acknowledges that based on the groundwater data from MMW-P-11S that Source Area A is likely larger than previously believed. Clearly, further delineation of Source Area A is needed. It should be noted that MMW-P-11S is located in the vicinity of a sanitary sewer line encountered during the installation of MMW-P-11D. The location and potential role of the sewer line as a preferential pathway should also be investigated by MUNDELL.

MUNDELL is planning to conduct a third injection per the Revised Work Plan for Third Round of CAP 18™ ME Injections dated July 22, 2011 (updated May 2, 2012). Approximately 14,600 pounds of CAP 18™ ME is to be injected in the three source areas (MUNDELL, May 2012). The source areas

remain inadequately characterized to successfully implement the prior Injections and the additional planned bioremediation injection.

Due to an absence of an adequate deep monitoring well network, the status of remedial progress and related amount of VC generation at the Plaza Site is not clear at depth. It is also not clear whether DNAPL is present at the Plaza Site and if remedial activities may have mobilized DNAPL. VC levels have increased significantly in the two deep monitoring wells present at the Site (MMW-P-03D and MMW-P-10D). The shallow monitoring well network also indicates that a significant amount of VC has been generated during the Plaza Site remediation. Further, the data indicate that the Plaza Site VC plume is expanding. Several monitoring wells in each source area that once did not contain a detectable VC concentration have since contained up to 6,500 times the Federal drinking water Maximum Contaminant Level of 2 micrograms per liter. Since the sources have not been fully characterized, it is not clear whether remedial efforts have been adequately targeting the source areas or what level of effort will be required to reduce the residual dry cleaning solvent contaminant concentrations to acceptable levels. Clearly the data indicate that additional shallow and deep monitoring wells should be installed by MUNDELL to monitor remedial progress and delineate the extent of related impacts, particularly west-southwest of Source Areas A and B.

2. Groundwater Flow Direction.

Figure 10B of the MUNDELL GSI Report is a conceptual site flow model for the deeper portion of the upper sand & gravel unit. The figure shows groundwater flow being substantially influenced by the unconfirmed till highs and lows illustrated on Figure 10A of the same report. As these features have not been demonstrated to be present, any prediction of groundwater flow influenced by their presence is pure speculation. The MUNDELL GSI report states "It should be noted that all of these groundwater flow directions in the deep sand and gravel unit shown on Figure 10B are not just theoretical constructions, but have been confirmed by recent (1st Quarter 2012) groundwater gauging events that include the additional recent deep wells installed by MUNDELL, and additional wells by ENVIRON (see 2012 shallow and deep groundwater potentiometric surfaces shown on Figures 16 and 17 in the AIAS report)." The hypothesized flow paths, particularly south of Michigan Street, are not consistent with potentiometric surface maps based on actual groundwater elevation data including Figure 12 of the MUNDELL Response Letter. For example, Figure 10B of the MUNDELL Response Letter speculates that south flowing groundwater west of Holt Road turns eastward, flows through an unconfirmed depression between two hypothesized till highs, and continues to flow to the east-southeast. Eastward flowing groundwater has not been observed on any relevant potentiometric surface map including Figure 12 of the MUNDELL Response Letter. Groundwater flow is generally south in this area. Figure 10B also shows flow being diverted around a hypothetical till hill. This flow pattern is not observed on Figure 12 of the MUNDELL Response Letter.

3. Distribution of c 1,2 DCE and VC.

MUNDELL prepared a series of dissolved VOC constituent plume maps for the shallow and deep portions of the surficial sand & gravel unit. Figures 15 and 16 of the MUNDELL Response Letter are shallow and deep c 1,2 DCE plume maps and Figure 18 is a deep VC plume map. It is not clear what data were used in the generation of these maps as no data points are included on the figures. The figure titles indicate that data from the October 2011 monitoring well groundwater sampling event were the basis of the maps. If so, consideration of this data alone would result in an incomplete

interpretation of dissolved plumes. The plume maps are inconsistent with available recent monitoring well and push probe data. The interpreted plumes are also inconsistent with and substantially different from past MUNDELL plume maps (e.g., Figs 1A-D and 2A-D of the MUNDELL Response Letter). As discussed below, it is apparent that critical data points have not been considered in preparing the MUNDELL Response Letter maps, resulting in interpreted plumes inconsistent with groundwater chemistry data. It is also apparent that at least the deep plume maps are inconsistent with the unlikely groundwater flow directions of the MUNDELL GSI Report conceptual groundwater flow model. Concerns identified with the c 1,2 DCE and VC plume maps are detailed below.

In the MUNDELL Response Letter, MUNDELL states: "The distribution of cis 1,2-DCE and VC in both the shallow and deep groundwater appears to have been affected by this geologic condition [*unconfirmed till features*] (see, for example, VC Delineation section, and Figure 18), and provides an explanation of the pathway from the originating source of both of these chemicals at the Genuine Site through the Michigan Meadows Apartments property and into all properties south of Michigan Street." This is clearly not the case. There are significant inconsistencies between Figure 10B of the MUNDELL GSI Report and the MUNDELL Response Letter plume maps, including Figure 18. For example, MUNDELL's inferred southwesterly groundwater flow in the deep zone toward the West Vermont Residential Site from the area of MW-165D illustrated on Figure 10B is inconsistent with groundwater chemistry data and the MUNDELL Response Letter deep c 1,2 DCE and VC plume maps (Figures 16 and 18). Figure 10B shows groundwater moving from MW-165D toward MMW-15S/D and MW-174S/D. Monitoring well MW-174D has not contained detectable VC concentrations and only a trace level of c 1,2 DCE. The push probe groundwater sample from MMW-15D did not contain detectable c 1,2 DCE or VC concentrations. Figure 10B shows groundwater flow being diverted around an inferred till hill southeast of the intersection of Michigan Street and Holt Road. Based on this interpreted groundwater flow, VC impacted groundwater would not flow from MW-167D toward MW-170D. Figure 18 of the MUNDELL Response Letter shows MW-167D and MW-170D along the axis of an inferred VC plume in the deep zone. As impacts at MW-170D are an order of magnitude greater than MW-167D, MUNDELL's interpretation that VC impacted groundwater flows from MW-167D toward MW-170D is inconsistent with the data.

MUNDELL's 2011 cis-1,2 DCE DELINEATION

In the MUNDELL Response Letter, statements are made regarding the Genuine Parts Site as a source of widespread c 1,2 DCE in groundwater based on the shallow and deep plume maps (Figures 15 and 16) and Figure 3 of the MUNDELL Response Letter. As previously discussed, there are significant inconsistencies and other issues with the MUNDELL plume maps and conceptual groundwater flow model (Figure 10B, MUNDELL GSI Report). Concerns with the c 1,2 DCE plume maps are further discussed below. Also, as previously discussed, Figure 3 is a poor and incomplete representation of c 1,2 DCE and VC impacts in groundwater. It is clear from the pre-Injection concentrations of c 1,2 DCE in the three identified Plaza Site source areas that it was present in shallow and deep portions of the sand unit at the Plaza Site prior to remediation and that the Plaza Site is the primary, if not sole source of this VOC in these areas (see ENVIRON Review Letter Table 2). Concentrations of c 1,2 DCE in the shallow and deep portions of the sand unit increased by one to two orders of magnitude following the Injections. Table 2 of the ENVIRON Review Letter provides a summary of pre- and post-Injection concentrations of c,12 DCE, as well as, VC.

1. *Figure 15-c 1,2 DCE in Shallow Groundwater.*

The interpreted c 1,2 DCE plume in the MUNDELL Response Letter is not consistent with monitoring well data from a number of locations. For example, wells MMW-2S, MW-165S, and MW-167S have not contained detectable c 1,2 DCE concentrations or levels < 5 micrograms per liter ($\mu\text{g/l}$) for several years, however, they are shown to be located in broad areas of >10 $\mu\text{g/l}$ on Figure 15 (Table 1, ENVIRON Review Letter). The resultant plume map is much greater than the actual data would indicate. Figure 15 in the MUNDELL Response Letter is inconsistent with past MUNDELL plume maps, particularly north of Michigan Street, even though there is no apparent new data to support the extensive plume illustrated on this figure. Examples of past MUNDELL interpretations for shallow c 1,2 DCE plume are provided as Figures 1A and 1C of the MUNDELL Response Letter. Copies of Figure 1A and 1C are provided in Attachment A of this correspondence for reference.

2. *Figure 16 c 1,2 DCE in Deep Groundwater.*

As with Figure 15, the interpreted c 1,2 DCE plume for deep groundwater in the MUNDELL Response Letter is not consistent with monitoring well data. The area of highest c 1,2 DCE concentrations is shifted further east than the data would indicate. There are also no data to support the extensive width of the plume shown on Figure 16. The plume of Figure 16 is inconsistent and substantially wider than past MUNDELL interpretations of c 1, 2 DCE in deep groundwater, particularly north of Michigan Street, even though there is no apparent new data to support this interpretation. For examples, see Figures 1B and 1D of the MUNDELL Response Letter (Attachment A). The extent of plume is much greater north of Michigan Street than past interpretations. The interpreted c 1,2 DCE plume of Figure 16 is also inconsistent with the conceptual flow model for the deep portion of the sand unit presented in the MUNDELL GSI Report (Figure 10B). Figure 16 in the MUNDELL Response Letter shows an extensive occurrence of c 1,2 DCE > 100 $\mu\text{g/l}$ south of Michigan Street (MW-167D). This occurrence is inconsistent with Figure 10B of the MUNDELL GSI Report which shows groundwater flow south of MW-167D being diverted to the east around a hypothesized till hill.

MUNDELL's 2011 VC DELINEATION.

1. *Figure 18 VC in Deep Groundwater*

As with Figures 15 and 16 of the MUNDELL Response Letter, Figure 18-VC in Deep Groundwater is inconsistent with monitoring well data. For example, well MW-167D is shown to be located within an area of >100 $\mu\text{g/l}$ in the interpreted plume. Concentrations of VC have generally been < 25 $\mu\text{g/l}$ at this location for several years (Table 1, ENVIRON Review Letter). Monitoring well MMW-P-14D is shown within an area of >10 $\mu\text{g/L}$ and near the >100 $\mu\text{g/l}$ contour, although a concentration of 5.1 $\mu\text{g/l}$ was reported for a push probe sample from this location. No monitoring well data were provided for MMW-P-14D in the MUNDELL AIAS Report. The omission and apparent lack of consideration of available data has resulted in an unreliable presentation of VC occurrence in the deep zone. Figure 18 is inconsistent with and substantially different from past MUNDELL interpretations of VC in deep groundwater, particularly north of Michigan Street (see Figures 2B and 2D of the MUNDELL Response Letter-Attachment A of this correspondence). The extent of plume is much greater north of Michigan Street than past interpretations. The interpreted VC plume of Figure 18 in the MUNDELL

Response Letter is also inconsistent with the conceptual flow model for the deep portion of the sand unit presented in the MUNDELL GSI Report (Figure 10B). Figure 18 shows an apparent axis of an extensive VC plume from MW-166D down through MW-167D to MW-170D and MMW-P13D. As discussed above, this axis is inconsistent with laboratory data from the monitoring wells. In addition, Figure 10B of the GSI Report shows groundwater flow south of MW-167D being diverted to the east around a hypothesized till hill. This flow pattern is inconsistent with the interpreted VC plume. As previously discussed, c 1,2 DCE and VC impacted groundwater would not flow from MW-167D toward MW-170D. C 1,2 DCE is present in MW-167D but not MW-170D. More importantly, VC impacts at MW-170D are an order of magnitude greater than MW-167D. Therefore, it is highly unlikely that c 1,2 DCE and VC impacted groundwater flows from MW-167D toward MW-170D. VC impacts reported at MW-170D have more than doubled since the bioremediation Injections were initiated at the Plaza Site to address the source areas of the Plaza Site. Further delineation of the source areas, as well as, investigation between the source areas and the West Vermont Street Residential Site is needed to better understand the potential relationship.

In the MUNDELL Response Letter, MUNDELL states that Figure 18 illustrates a reported “separation or saddle area” between two hypothesized plumes based on relative VC concentrations in wells MMW-P-11D, MMW-P-12D, and MMW-P-13D. As previously discussed, there are several concerns and inconsistencies with Figure 18. Well MMW-P-13D is located in general vicinity of Source Areas A and B. The western extent of these source areas have not been delineated, therefore, the distance of MMW-P-13S/D to these sources is not certain. Based on the proximity of MMW-P-13S/D to these source areas and similarity of identified dissolved VOC concentrations, the impacts identified at this well nest are much more likely attributable to a local source at the Plaza Site.

MUNDELL's PLUME DELINEATION and MONITORING SUMMARY

As discussed throughout this correspondence and the ENVIRON Review Letter, there are significant concerns with the status of plume delineation by MUNDELL. The Plaza Site source areas are not fully delineated (see Figure 4, ENVIRON Review Letter). Further delineation of the Plaza Site source areas should be conducted by MUNDELL, particularly to the west. Plume maps prepared for the MUNDELL Response Letter and MUNDELL AIAS Report do not provide reliable interpretations of dissolved VOC occurrence. More monitoring wells are needed in addition to those proposed by MUNDELL. Additional deep monitoring wells should be installed by MUNDELL in the Plaza Site source areas to delineate dissolved VOC occurrence and monitor remedial progress. Further investigation should be conducted by MUNDELL between the Plaza Site and West Vermont Residential Site to better understand the direction of groundwater flow and dissolved VOC occurrence in this area. The presence of potential preferential pathways such as the sanitary sewer line encountered during the installation of MMW-P-11D should be evaluated as a part of this investigation.

MUNDELL's DEPTH and BEHAVIOR of BASAL TILL UNIT

As discussed throughout this correspondence and the ENVIRON Review Letter, the Top of Till Map (Figure 19 in the MUNDELL Response Letter) does not provide a reliable interpretation of the till surface. Unconfirmed till surface features (e.g., till hill) are interpreted to be present across the area based primarily on uncalibrated resistivity data. These unproven features are interpreted by MUNDELL to control groundwater flow and related chemical fate and transport within the lower

portion of the sand and gravel unit. The inferred flow patterns are not consistent with those based on actual groundwater potentiometric surface data. MUNDELL should field verify the presence of the till surface features interpreted to be present in the MUNDELL GSI Report.

C. MUNDELL'S Responses to IDEM's Specific Comments.

IDEM Comment No.1.

As previously discussed throughout this correspondence and the ENVIRON Review Letter, the Plaza Site source areas and related groundwater impacts (e.g., VC) have not been adequately delineated by MUNDELL. Further investigation should be conducted by MUNDELL between the Plaza Site and West Vermont Residential Site to better understand the direction of groundwater flow and dissolved VOC occurrence in this area. The presence of potential preferential pathways such as the sanitary sewer line encountered during the installation of MMW-P-11D should be evaluated as a part of this investigation.

IDEM Comment No.2.

As previously discussed throughout this correspondence and the ENVIRON Review Letter, additional deep monitoring wells should be installed within and outside of the source areas to delineate related impacts and to evaluate remedial progress. Additional deep wells installed within the source areas would also be useful in further evaluating the potential presence of DNAPL in these areas. The limited push probe data collected to date are not adequate for this purpose.

In addition, the downhole geophysical surveys conducted as a part of the MUNDELL AIAS Report do not clearly indicate soil types present in the blind drilled sections or the till surface contact in deeper monitoring wells. Actual geologic data should be collected by MUNDELL from the locations of MUNDELL's blind drilled wells, particularly deep wells presumed to be screened at the sand/till contact (e.g., MMW-11D, 13D and MMW-14D; MMW-P-3D, 9D, 10D). In the absence reliable geologic data for wells MMW-13D and MMW-14D, they should not be used for remediation or closure purposes as stated in MUNDELL's response to IDEM Comment No.4.

IDEM Comment No.3.

As previously discussed throughout this correspondence and the ENVIRON Review Letter, MUNDELL's Top of Till Map (Figure 19) is not reliable and further delineation of the Plaza Site impacts to the west toward Holt Road should be conducted by MUNDELL. The recently discovered sewer line found during the installation of MMW-P-11D, as well as any other utilities or other potential preferential pathways in the area, should be investigated.

IDEM Comment No.4.

Actual geologic data should be collected from the areas of MUNDELL's blind drilled monitoring wells as discussed above (IDEM Comment No.2). As discussed throughout this correspondence, MUNDELL's Figure 19 is not a reliable representation of the basal till surface.

IDEM Comment No.7.

As discussed throughout this correspondence and the ENVIRON Review Letter, the Plaza Site source areas and related impacts have not been delineated by MUNDELL. Available data do indicate the Plaza Site as a potential "...source of the chemical impacts at the residential properties."

IDEM Conclusion.

As discussed throughout this correspondence and the ENVIRON Review Letter, the Plaza Site is the primary source of PCE and related daughter products throughout the entire thickness of the sand & gravel unit within and downgradient of the Plaza Site source areas. Additional delineation of the Plaza Site source areas should be conducted by MUNDELL, as well as, additional investigation of potentially related impacts west of the Plaza Site toward the West Vermont Street Residential Site.

Should you have any questions regarding this correspondence, please contact me at your convenience.

Very truly yours,

ENVIRON International Corporation

A handwritten signature in blue ink, reading "Andrew Gremos".

Andrew A. Gremos, LPG, CHMM
Principal

Enclosures

REFERENCES

- ENVIRON International Corporation (ENVIRON), June 7, 2012, Additional Activities Summary Report Review Letter, Michigan Plaza Site (VRP #6061202).
- Indiana Department of Environmental Management (IDEM), June 22, 2011, Request for Revised Remediation Work Plan Approval Review and Technical Response to General Notice of Potential Liability Review, Michigan Plaza Site (VRP #6061202).
- KERAMIDA Environmental, Inc. (KERAMIDA), August 16, 2004, Final Remediation Work Plan, Former General Motors Corporation Allison Gas Turbine Division Plant 10, Genuine Parts Company site.
- Mundell & Associates, Inc. (MUNDELL), May 2, 2012, Revised Work Plan for Third Round of CAP 18 ME™ Injections, Michigan Plaza Site (VRP #6061202).
- MUNDELL, March 16, 2012, Additional Investigation Activities Summary Report, Michigan Plaza Site (VRP #6061202).
- MUNDELL, March 16, 2012, Report of Geophysical Survey Investigation, Michigan Plaza Site (VRP #6061202).
- MUNDELL, March 16, 2012, Response to IDEM's Request for Revised Remediation Work Plan Approval Review and Technical Response to General Notice of Potential Liability Review, Michigan Plaza Site (VRP #6061202).
- MUNDELL, July 22, 2011, Revised Work Plan for Third Round of CAP 18 ME™ Injections, Michigan Plaza Site (VRP #6061202).
- MUNDELL February 28, 2008, Remediation Work Plan, Michigan Plaza Site (VRP #6061202).
- MUNDELL April 1, 2007, Further Site Investigation Addendum I Report, Michigan Plaza Site (VRP #6061202).
- MUNDELL, May 10, 2006, Further Site Characterization Report, Michigan Plaza Site (VRP #6061202).

Attachment A
ENVIRON June 2012 AIAS Review Letter & related MUNDELL Documents